

REMARKS:

Claims 32 and 33 have been allowed. New claims 34 and 35 depend directly or indirectly from claim 32 and are thus believed to be in condition for allowance.

The specification as filed supports the limitations of new claims 34-37 and thus these claims are believed to add no new matter to the application. Support for the limitations of claims 34-37 can be found in the specification at, for example, the first full paragraph on page 10, the description of Fig. 5 at pages 9-10, and the description of Fig. 8 (and comparison thereof to Fig. 5) at page 13, line 16 through page 14, line 3.

New claims 34-37 and claim 1 as hereby amended recite the phrases “maximum impact ionization point” and “hot carrier ionization.” The specification (at page 1, second paragraph) defines “hot carrier ionization” in an MOS device as “the phenomenon that energetic (“hot”) carriers in the drain or extended drain region or body of the device (e.g., in a well/drain depletion region) ionize atoms (usually silicon atoms) in the drain or extended drain region or body, thereby creating electron-hole pairs.” The specification (at page 1, third paragraph) defines “maximum impact ionization point” as “the region in an MOS device in which the probability of hot carrier ionization exceeds an appropriately defined threshold.”

Claims 1-10 stand rejected under 35 U.S.C. 102(b) as being anticipated by US Patent 5,306,652 (“Kwon”). In response, claim 9 is hereby canceled and claim 1 is hereby amended. Applicants contend for the following reasons that claims 1-8 and 10 as amended and new claims 36-38 are patentable over Kwon.

Kwon describes an LDMOS device (shown in Kwon’s Fig. 4) including a drain 36, an epitaxial layer 34, and a drift region 24. Even if one assumes for the sake of argument that Kwon’s drain 36, layer 34, and region 24 correspond respectively to the drain, deep drain implant, and lightly doped drain implant recited in claim 1, amended claim 1 is patentable over Kwon since Kwon neither teaches nor suggests a PMOS device having a maximum impact ionization point, a body, and an extended drain region including a drain, a deep drain implant, and a lightly doped drain implant, wherein the maximum impact ionization point is

located below the lightly doped drain implant within at least one of the body and the extended drain region so as to reduce any drain breakdown voltage walk-in exhibited by the device below a predetermined value, as recited in amended claim 1.

Kwon teaches (at col. 4, lines 19-21) that the device of Fig. 4 thereof can be implemented so that breakdown occurs beneath drain 36 rather than at the surface. However, this does not amount to a teaching or suggestion that the Fig. 4 device can or should be implemented with a maximum impact ionization point located below a lightly doped drain implant and so as to reduce any drain breakdown voltage walk-in exhibited by the device (i.e., located below the lightly doped drain implant in such a position that any drain breakdown voltage walk-in exhibited by the device has a magnitude below) below a predetermined value.

The explicit limitation in claim 1 that the recited maximum impact ionization point is located below a lightly doped drain implant and so as to reduce any drain breakdown voltage walk-in exhibited by the device below a predetermined value (i.e., is located below the lightly doped drain implant in such a position that any drain breakdown voltage walk-in exhibited by the device has a magnitude below a predetermined value) is a structural limitation of the claimed device. The Office Action does not identify any teaching or suggestion in Kwon of such a limitation, and does not take the position (or identify any basis determinable from art of record for the position) that a device disclosed in Kwon inherently has a maximum impact ionization point located below a lightly doped drain implant so as to reduce any drain breakdown voltage walk-in exhibited by the device below a predetermined value.

Kwon also fails to teach or suggest a PMOS device (having a gate, a body, an extended drain region, and a lightly doped drain implant, as claimed) having both a drain junction breakdown point and a maximum impact ionization point located sufficiently far from the gate that the device exhibits no significant drain breakdown voltage walk-in (as recited in claim 2 or 4) or so that any drain breakdown voltage walk-in exhibited by the device has absolute magnitude not greater than two volts (as recited in claim 3). There is no basis determinable from Kwon in support of the position that a device disclosed in Kwon

inherently has both a maximum impact ionization point and a drain junction breakdown point so located.

Claims 34, 35, 36 and 37 are patentable over Kwon since there is no teaching or suggestion determinable from Kwon of a PMOS device (having a gate, gate oxide, a body, an extended drain region, and a lightly doped drain implant, as claimed) whose maximum impact ionization point is located below the lightly doped drain implant and sufficiently far from the gate to prevent hot carrier ionization in the extended drain region and body during stressed operation from causing significant charge injection to the gate oxide during said stressed operation.

The application's specification describes (e.g., at p. 6, line 25- page 7, line 8, p. 9, line 3 to p. 10, line 12, and page 13, line 16 through page 14, line 3) the inventors' recognition, and test results (including those plotted in Figs. 5 and 8) that indicate, that electron injection during stress to the gate or gate oxide of a device of the recited type (having a gate, body, extended drain region, lightly doped drain implant, and typically also gate oxide) due to ionization caused by hot carriers in the drain or body is responsible for drain breakdown voltage (Bvdss) walk-out, and injection of positive charge during stress to the gate or gate oxide of such a device (due to ionization caused by hot carriers in the drain or body) is responsible for Bvdss walk-in. In this context, the specification explains that locating the maximum impact ionization point and drain junction breakdown point of such a device sufficiently far from the gate virtually eliminates (i.e., reduces by "on the order of 10^6 ") gate current due to hot carrier injection during stressed operation (e.g., operation with voltage substantially equal to 80 volts between the device's source and drain) relative to that in comparable conventional devices having maximum impact ionization point and drain junction breakdown point located nearer to the gate)).

In view of the foregoing, reconsideration and allowance of the claims as amended and the new claims is respectfully requested.

Respectfully submitted,

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